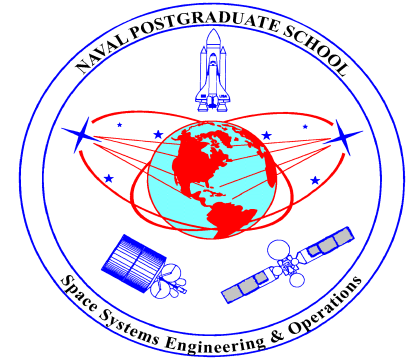




NAVAL POSTGRADUA TE SCHOOL

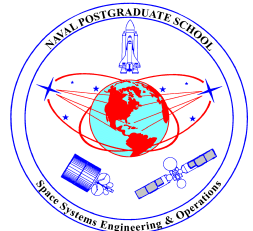


NPS Space Systems Program Orientation

29 June 2006
CAPT Al Scott



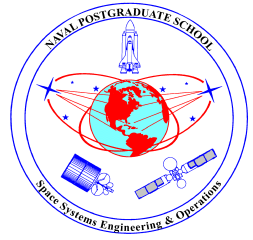
Agenda



- Introductions
- Space Systems Program Overview
 - Curricula Background
 - Student and Faculty Composition
 - Research and Lab Facilities
 - Curricula Matrices/Course Content
- Program Office/Academic Associate Support
- Administrivia
- Questions



Introductions



Space Systems Academic Group (SSAG) Chair Prof Rudy Panholzer

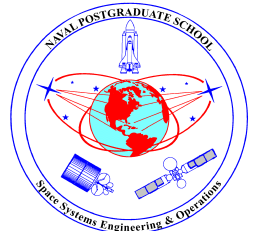
Academic Associates

Space Systems Engineering (591) Prof Ashok Gopinath

Space Systems Operations (366) Prof Don Wadsworth

Educational Technician (Your best friend!) Ms Sandra Stephens

Program Officer CAPT Al Scott



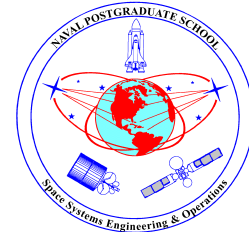
Space Systems Curricula Overview

Space Systems Operations (366)
Space Systems Engineering (591)



Why Space Systems?

The Navy Space Cadre



A distinct body of expertise horizontally and vertically integrated within the Navy active duty, reserves, and civilian employee communities organized to “operationalize” space

Assessment

Feedback real world; influence process; Validate Space Effects

Requirements

Articulate, defend maritime Rqmts; Understand all services capabilities

S&T/R&D

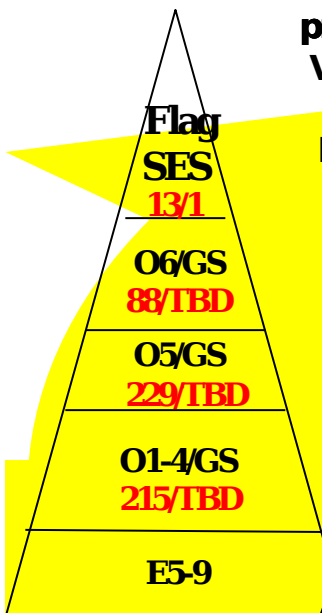
Develop technology for Naval needs

Acquisition

Protect Navy reqmts; integrate in Navy systems; Asst w/ others/Joint

Operations

Integrate space into fleet ops/operate systems; Understand adversary capabilities



Space Cadre - Foundation for Space Strategy

Civilians
TBD
96+

Enlisted
TBD
~500

URL
122
261

IP
HR
LDO
102
97

ED
AED
47
95

Cryp
Intel
38
89

OCEANO
0
3

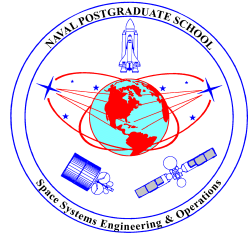
Reserves
83+

Blue = Billets
Red = Inventory

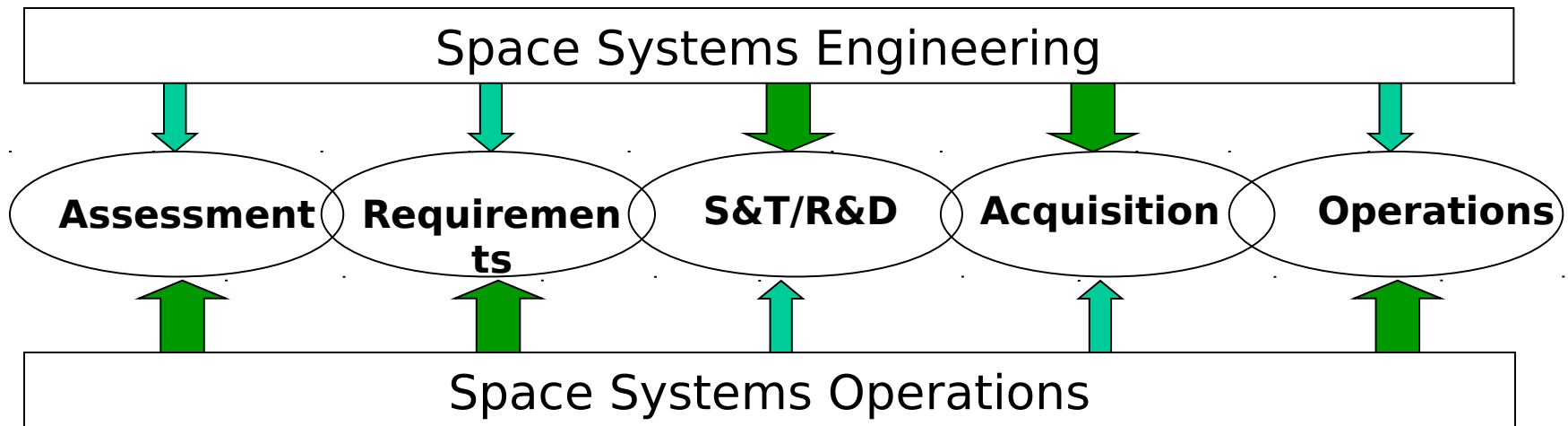


NPS and the Space Cadre

"A Space Educated Cadre is Key"



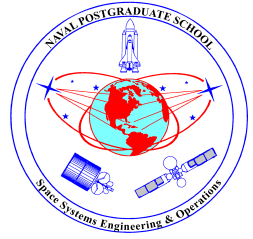
- **Navy Sponsors establish Educational Skill Requirements (ESR's) to ensure cadre educational needs are met**
 - Space Systems Engineering: Sponsored by NAVSEA with oversight delegated to SPAWAR Space Field Activity
 - Space Systems Operations: Sponsored by OPNAV N61, Navy Space Systems Division and Naval Network Warfare Command
- **NPS curricula are designed to meet ESR's**



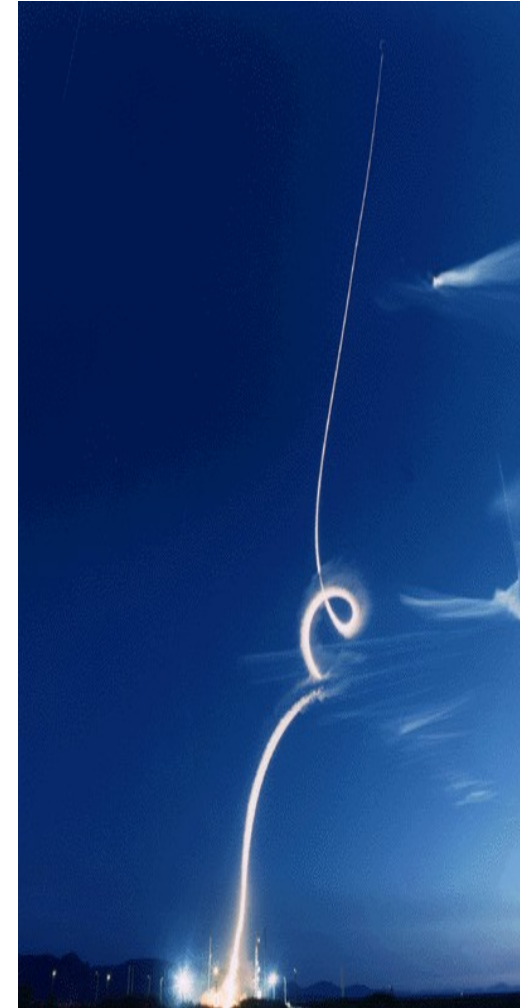
Educated and experienced Space Cadre personnel must fill each link in the "National Security-Space Chain."



Space Systems Curricula

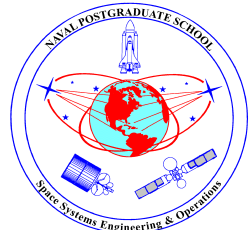


- **Space Systems Engineering Curriculum**
 - Provides students with a comprehensive scientific and technical knowledge of military space systems, with a focus on systems design.
 - Critical for the cadre's participation in technical requirements, S&T/R&D, and acquisition in an operational context.
- **Space Systems Operations Curriculum**
 - Provides students with a broad knowledge of military systems and applications in Space, with a focus on the Exploitation of Space and Information Products.
 - Emphasizes user requirements and operations, as well as providing overview of S&T/R&D/Acquisition.



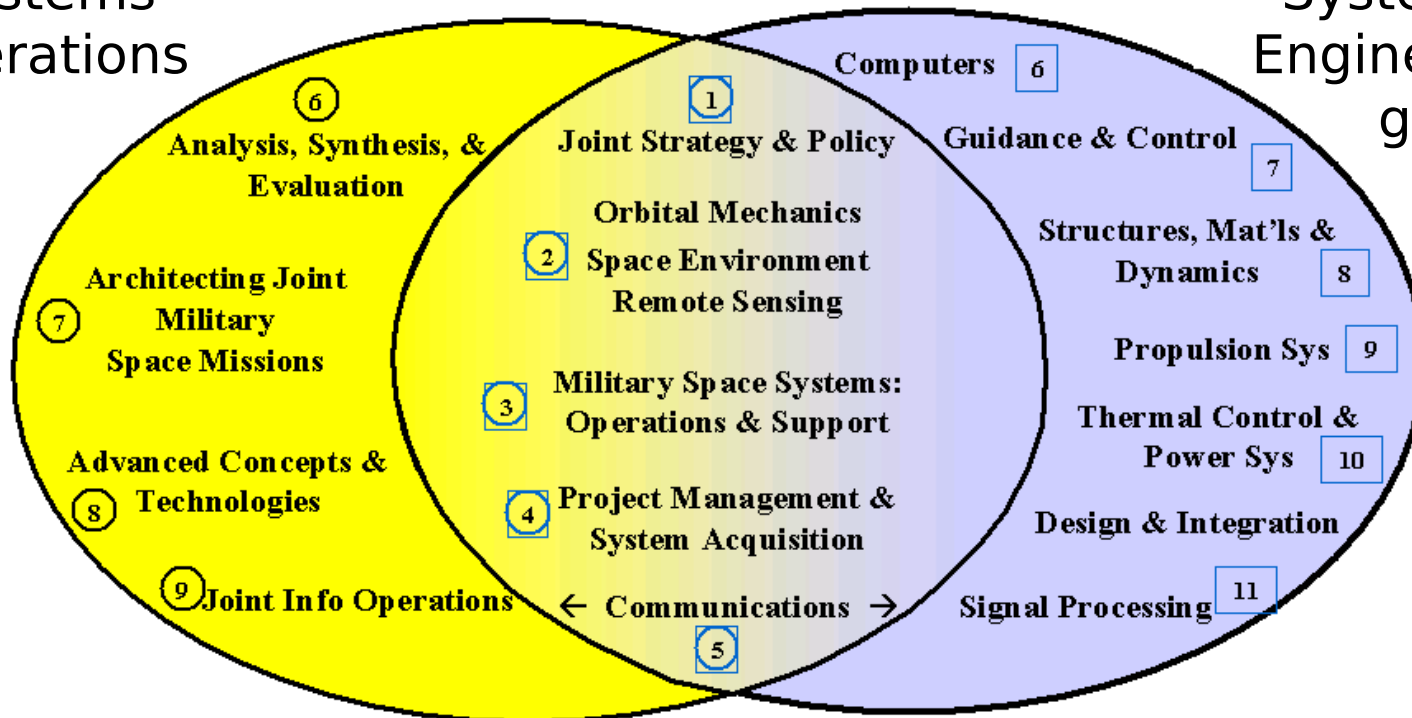


Space Systems Program Content



Space
Systems
Operations

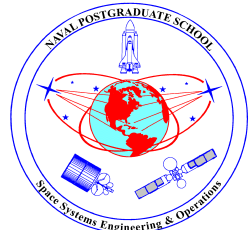
Space
Systems
Engineering



Space Systems Operations and Space Systems Engineering share **common content** that creates a synergy between both curricula and comprehensively covers Space Topics



NPS Space Systems Program

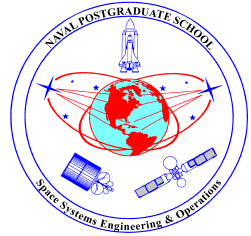


~~Tailored to Defense Needs~~

- Curricula developed over 20 years
 - Coursework and research efforts tailored to support design, development, acquisition and operation of space systems in support of the military.
- Military Space Systems application courses
 - Military Applications, Remote Sensing, SIGINT, MILSATCOM, etc...
 - Emphasis on operational employment /systems engineering and defense acquisition management
 - Space Control is being added this year.
- Classified courses and research (Secret through TS/SCI level) with full connectivity
 - 6,600 sq ft SCIF with connections to NRO GWAN, NSA Net, JWICS and SIPRNET
 - 115 NPS faculty are cleared to TS/SCI



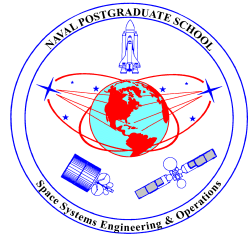
Core Strengths - NPS Space Systems



- **National Security Focus** of Space Systems Engineering and Space Systems Operation Programs
- **Systems Engineering Approach** – curricula culminated by capstone system/architecture design projects
- Enduring **classified research** programs sponsored by NRO/NSA/AFRL/etc.
- **Integrated Student Experiences** – Exposure to National Security Space Organizations
 - Familiarization and research with National Space Organizations – USSTRATCOM, NNSOC, DARPA, NRO, NSA, etc...
 - Exposure to current U.S. Space systems that support the military and the National Command Authority
 - 6-weeks thesis/work experience at Defense Contractors or National Labs on independent thesis research
- **Multi-disciplinary Curricula** – Integrated program with course content and expertise provided from numerous academic departments across NPS campus (including Math, Physics, Electrical Engineering, Mechanical/Astronautical Engineering, Information Warfare/Information Operations, Operations Research and Acquisition/Management).



NPS Space Systems Enrollment Mar 2006



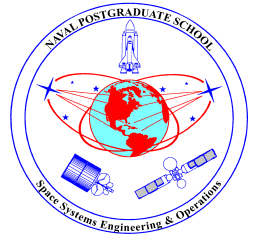
NPS has students from all Services representing many warfare communities. This **joint** effort provides a unique experience and operational perspective to share at our school.



<u>Service</u>	<u>Num of Students</u>
Navy	38
Marine	5
Army	7
Air Force	11
Total	61



NPS Space Systems Program Serves a Broad Range of Customers



Navy

OPNAV/HQMC, CFFC, NNWC, NNSOC, ONR,
SYSCOMS – SPAWAR/NAVAIR/NAVSEA, NSG, Fleet
N2/3/N6, NRL/NCST, TENCAP

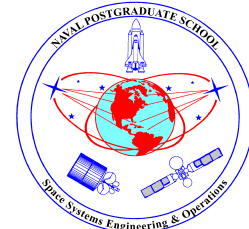
USAF/Other Agencies

NRO, NGA, AF/SMC, DARPA, AFRL, USSTRATCOM,
Joint Staff, NSSO, DIA (CMO), MDA, NPOESS IPO,
CIA

These Organizations employ
NPS graduates and fund NPS Research



Follow-on Orders for SSO Graduates



Space Sys Ops - 2003

- **4 USN**
 - 1 USSTRATCOM
 - 1 SWO School Command
 - 1 Naval Security Group
 - 1 Flt Info Warfare Center Det, SD
- **3 USA**
 - 2 SMDC, Crystal City
 - 1 8th Army, Korea
- **2 USMC**
 - 1 NRO
 - 1 MARCORSPACE

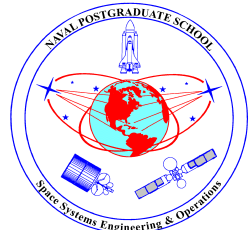
Space Sys Ops - 2004

- **5 USN**
 - 1 USS Carl Vinson
 - 1 DESRON 15 Staff, Japan
 - 2 SWO School Command
 - 1 SPAWAR Space Field Activity (NRO)
- **3 USA**
 - 1 4th ID/Space Spt Element (G3)
 - 1 10 IN HHC Mountain LID (WGKEAA) Fort Drum
 - 1 U.S. Army SMDC
- **1 USMC**
 - 1 NRO

NPS graduates fill critical space billets
in many Space Organizations



Follow-on Orders for SSE Graduates



Space System Eng 2003 Space System Eng 2004

- **7 USN**

- 3 SWO School Command
- 2 SPAWAR Systems Center
- 1 Strategic Systems Program
- 1 SUPSHIP

- **1 USAF**

- NRO - AF Special Projects

- **1 USA**

- 1 8th Army, Korea

- **9 USN**

- 1 NSWC Crane
- 3 SPAWAR Systems Center
- 2 SPAWAR Space Field Activity (NRO)
- 1 Strategic Systems Program
- 2 Sub Warfare School

- **1 USAF**

- NRO - AF Special Projects

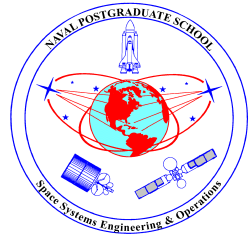
- **1 USMC**

- MARFORSTRAT

NPS graduates fill critical space billets
in many Space Organizations



Space Systems Program Faculty



Space Systems Academic Group (SSAG)

Program built upon the expertise and knowledge contained in SSAG-Interdisciplinary Association of 20 Faculty Members and 7 Academic Chairs (26 with TS/SCI Clearances)

- **Representation of 7 Academic Disciplines:**

- Mechanical and Astronautical Engineering
- Electrical and Computer Engineering
- Mathematics
- Meteorology
- Physics
- Systems Management
- Information Operations

- **7 Academic Chairs/Visiting Faculty Representing**

- NASA
- TENCAP
- NRO
- Naval Space Technology Program
- Naval Network & Space Operations Command
- Space Industry (Lockheed Martin)
- MASINT

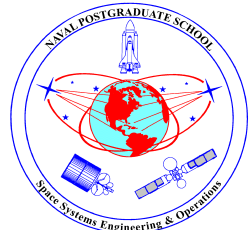
- **2 Military Faculty**

- USN CAPT
- USAF LCol.

NPS Program - heavily engaged with many Space Organizations



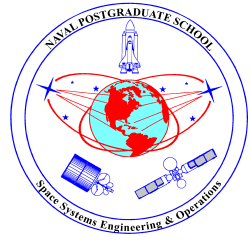
Samples of Current Space Systems Research Projects



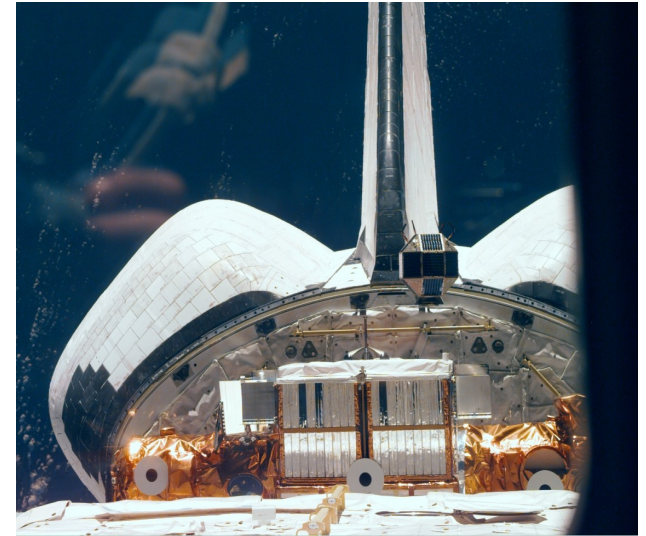
- **Remote Sensing Target And Plume Detection.** Detection of motion and vibration with space-borne commercial sensors--Prof. RC Olsen.
- **Autonomous Spacecraft Docking And Servicing/Multi-spacecraft Proximity Navigation and On-orbit Assembly**--Prof. Marcello Romano.
- **Maritime Domain Awareness (MDA).** Make effective use of all available information to improve MDA by fusing multiple sources of dissimilar data--Profs. Hersch Loomis, Dan Boger, Tom Betterton, Don Wadsworth, Alan Ross.
- **Configurable Fault Tolerant Processor.** Develop techniques to improve the reliability and performance of FPGA based reconfigurable computers in the space environment--Profs. Hersch Loomis, Alan Ross.
- **Space Situational Awareness.** Detection, tracking and cataloguing of objects in the 1-5 cm range, more precise orbit determination/prediction and development of better estimates of the uncertainty in orbit determination and prediction--Prof. Terry Alfrend.
- **Bifocal Relay Mirror Project.** Relay laser beams from one earth station to another location on the earth or in space--Prof. Brij Agrawal.
- **Trident Missile RB Vulnerability.** Exo-atmospheric nuclear weapon intercept modeling. Improve simulation fidelity for prediction of effectiveness of new threats to re-entry body materials-- Profs. Don Wadsworth, Ashok Gopinath.



NPS Space Systems Laboratory Facilities



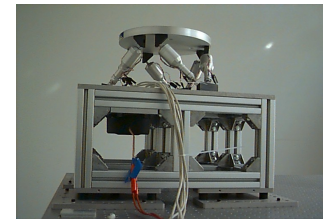
- Extensive and Unique Facilities for Space-related Research
 - **NPS-AFRL Optical Relay Spacecraft Laboratory**
 - **Center for Radiation Hardened Electronics**
 - **Smart Structures Laboratory**
 - **Clean Room (class 10,000)**
 - **Solar Simulator**
 - **Rocket and Combustion Lab**
 - ***And of course the SCIF***



NPS Conducted over \$4.5M in Space-Related Reimbursable Research in FY-04



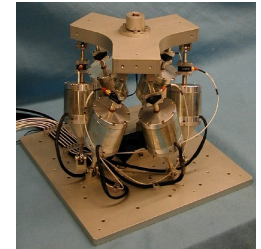
Flexible Spacecraft Simulator



Ultra-Quiet Platform

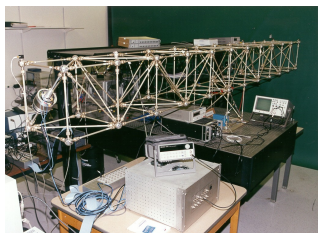


Three-axis-simulator

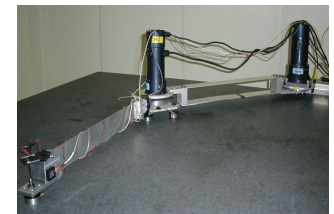


Positioning Hexapod

Spacecraft Research and Design Center



NPS Space Truss



Space Robot Simulator



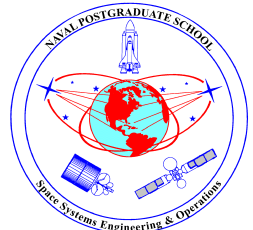
Fltsatcom Laboratory



Spacecraft Design Laboratory

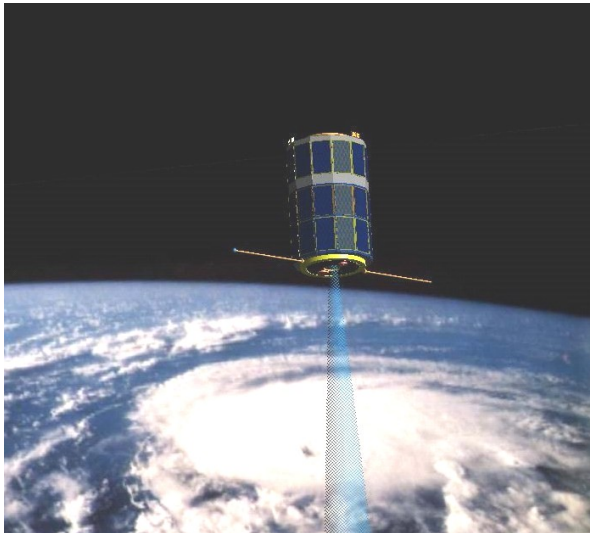


NPS Small Satellite Design Program



PANSAT launched aboard STS-95 (Oct. 1998)

- **Experience for NPS students, faculty and staff (build-test-fly)**
- **50+ graduate theses**
- **Amateur radio digital communications**
- **Tumbling, 'simple' space vehicle**

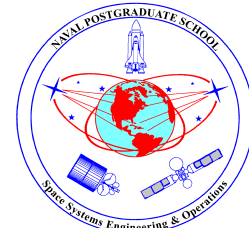


NPSAT1 - Manifested on STP-1 Atlas V EELV (NET October 2006)

- **Hands-on education in Space Systems**
- **Class D spacecraft**
- **Demonstrating low-cost, small satellite technology**
- **Platform for 2 NRL experiments + 4 NPS experiments**



Space Systems Design/Development Facilities



Design



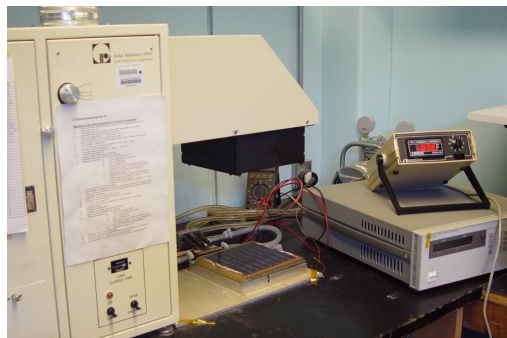
Build



Test



Electronics Build &
Test



Solar Simulator



Vibration Shaker



CAD/CAE
Workstations



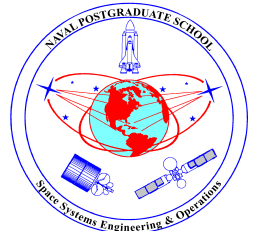
CNC Mill



Thermal-
Vacuum
Chamber



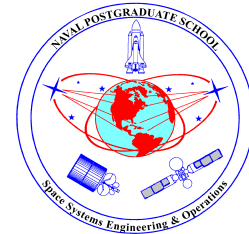
Your Academic Matrix (Cont)



- Consequently, an NPS MS degree is approximately 1.8X the coursework of a traditional MS program
 - The major difference is the breadth of the education
- Python – is the place to go for changes to your matrix
 - Changes impacting ESR fulfillment will be carefully scrutinized
 - Please provide detailed explanation in remarks column



Space Systems Operations (366) Core Curriculum w/Refresher (Navy)



QUARTER	COURSE	COURSE	COURSE	COURSE	COURSE
0 (refresher-- 12 wks recom.) 18	MA1113 (4-0) Single Var Calc	MA1114 (4-0) Matrix Algebra	PH1001 (4-2) Mechanics	PH1002 (4-2) Electricity & Mag	
1 (fall) 15.5	MO1903 (3-0) Applied Math for Space Sys	SS3011 (3-0) Space Tech/Appl	CC3000 (4-0) C4ISR IS Requirement USN	TPME - All USN NW3230(4-2) Strat&Policy	SS4000 (0-1) Seminar
2 (winter) 17	OS2100 (3-1) Probability/Stats	SS3500 (4-2) Orbital Mech & Launch Sys	IS3502 (3-2) Comp Networks IS Requirement USN	TPME - USN URL NW3285 (4-0) NSDM	SS4000 (0-1) Seminar
3 (spring) 17.5	EO3516 (4-2) Intro Comm Sys Eng	PH2514 (4-0) Space Environment	AF4830 (3-2) S/C Systems 1	TPME - USN URL NW3275 (4-0) JMO Part 1	SS4000 (0-1) Seminar
4 (summer) 18.5	EO4516 (4-2) Comm Sys Anal	MN3331 (5-1) ACQ Mgmt	CS3000 (4-1) Great Principles of Comp Tech IS Req - USN	TPME - USN URL NW3276 (2-2) JMO Part 2	SS4000 (0-1) Seminar
5 (fall) 16.5	PH3052 (4-0) Remote Sensing	SS3041 (4-2) Space Sys & Ops 1 SECRET	SS3613 (3-0) MILSATCOM Sys & Appl SECRET	AF 4831 (3-2) S/C Systems 2	SS4000 (0-1) Seminar
6 (winter) 16.5	SS3051(4-0) Space Control (1st half QTR) TS/SCI	SS3001 (3-2) Mil Appl of Space (1st half QTR) TS/SCI	SS0810 (0-8) (2nd half QTR)	Exnerience Tour (2nd half QTR)	SS4000 (0-1) Seminar
7 (spring) 17	SS4051(3-2) Mil Space Sys/ Arch TS/SCI	SS0810 (0-8) Thesis	Elective	IS Requirement TW 3101 (4-1) Info Operations	SS4000 (0-1) Seminar
8 (summer) 16	SS 0810 (0-8) Thesis	SS 0810 (0-8) Thesis	Elective	OS3307 (4-1) Modeling Practice IS Requirement USN	SS4000 (0-1) Seminar

Includes:

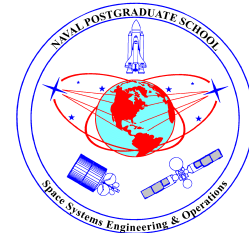
- Full Refresher Quarter
- Integrated JPME
- N6 Info Systems Courses
- Two Elective Slots

Legend

Prep Courses
366 Core
N6 IS core - USN Only
JPME



Space Systems Operations (366) Core Curric w/Enhanced Refresher



QUARTER	COURSE	COURSE	COURSE	COURSE	COURSE
0 (refresher- 12 wks recom) 16	MA-1010 (5-0) Algebra & Trigonometry	PH1000 (4-0) Nature and Structure of Physics	SS3011 (3-0) Space Tech/Appl	JPME NW3230(4-2) Strat&Policy	
1 (fall) 19.5	MA1113 (4-0) MA1114 (4-0) Single Var Calc Matrix Algebra	MO1903 (3-0) Applied Math for Space Sys	PH1121 (4-2) Mechanics	PH1322 (4-2) Electromagnetism	SS4000 (0-1) Seminar
2 (winter) 17	OS2100 (3-1) Probability/Stats	SS3500 (4-2) Orbital Mech & Launch Sys	IS3502 (3-2) Comp Networks IS Requirement USN	JPME - USN URL NW3285 (4-0) NSDM	SS4000 (0-1) Seminar
3 (spring) 17.5	EO3516 (4-2) Intro Comm Sys Eng	PH2514 (4-0) Space Environment	AE4830 (3-2) S/C Systems 1	JPME - USN URL NW3275 (4-0) JMO Part 1	SS4000 (0-1) Seminar
4 (summer) 18.5	EO4516 (4-2) Comm Sys Anal	MN3331 (5-1) ACQ Mgmt	CS3000 (4-1) Great Principles of Comp Tech IS Req - USN	JPME - USN URL NW3276 (2-2) JMO Part 2	SS4000 (0-1) Seminar
5 (fall) 16.5	PH3052 (4-0) Remote Sensing	SS3041 (4-2) Space Sys & Ops 1 SECRET	SS3613 (3-0) MILSATCOM Sys & Appl SECRET	AE 4831 (3-2) S/C Systems 2	SS4000 (0-1) Seminar
6 (winter) 16.5	SS3051(4-0) Space Control (1st half QTR) TS/SCI	SS3001 (3-2) Mil Appl of Space (1st half QTR) TS/SCI	SS0810 (0-8) (2nd half QTR)	Experience Tour (2nd half QTR)	SS4000 (0-1) Seminar
7 (spring) 17	SS4051(3-2) Mil Space Sys/ Arch TS/SCI	SS0810 (0-8) Thesis	CC3000 (4-0) C4ISR IS Requirement USN	IW 3101 (4-1) Info Operations IS Requirement	SS4000 (0-1) Seminar
8 (summer) 16	SS 0810 (0-8) Thesis	SS 0810 (0-8) Thesis	Elective	OS3307 (4-1) Modeling Practice IS Requirement USN	SS4000 (0-1) Seminar

Includes:

- Full Refresher Quarter
- Integrated JPME
- N6 Info Systems Courses
- One Elective Slot

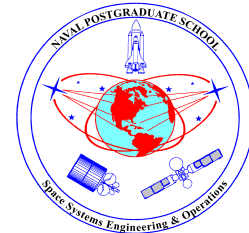
Legend

Prep Courses
366 Core
N6 IS core - USN Only
JPME



Space Systems Operations (366) Core

~~Curric w/out Refresher~~



QUARTER	COURSE	COURSE	COURSE	COURSE	COURSE
1 (fall) 19.5	MA1113 (4-0) MA1114 (4-0) Single Var Calc	MO1903 (3-0) Applied Math for Space Sys	PH1121 (4-2) Mechanics	SS3011 (3-0) Space Tech/Appl	SS4000 (0-1) Seminar
2 (winter) 18.5	OS2100 (3-1) Probability/Stats	SS3500 (4-2) Orbital Mech & Launch Sys	PH1322 (4-2) Elec & Mac	IPME - All USN NW3230(4-2) Strat&Policy	SS4000 (0-1) Seminar
3 (spring) 18.5	EO3516 (4-2) Intro Comm Sys Eng	PH2514 (4-0) Space Environment	AE4830 (3-2) S/C Svstems 1	IPME - USN URL NW3285 (4-0) NSDM	SS4000 (0-1) Seminar
4 (summer) 19	EO4516 (4-2) Comm Sys Anal	MN3331 (5-1) ACQ Mgmt	CC3000 (4-0) C4ISR IS Requirement	IS3502 (3-2) Comp Networks IS Requirement	SS4000 (0-1) Seminar
5 (fall) 20.5	PH3052 (4-0) Remote Sensing	SS3041 (4-2) Space Sys & Ops 1 SECRET	SS3613 (3-0) MILSATCOM Sys & Appl SECRET	AE 4831 (3-2) S/C Systems 2	SS4000 (0-1) Seminar
6 (winter) 16.5	SS3051 (4-0) Space Control (1st half QTR) TS/SCI	SS3001 (3-2) Mil Appl of Space (1st half QTR) TS/SCI	SS0810 (0-8) Experience Tour (2nd half QTR)	Experience Tour (2nd half QTR)	SS4000 (0-1) Seminar
7 (spring) 16	SS4051 (3-2) Mil Space Sys/ Arch TS/SCI	SS0810 (0-8) Thesis	IW 3101 (4-1) Info Operations IS Requirement	IPME - USN URL NW3275 (4-0) JMO Part 1	SS4000 (0-1) Seminar
8 (summer) 17	SS 0810 (0-8) Thesis	SS 0810 (0-8) Thesis	OS3307 (4-1) Modeling Practice IS Requirement	IPME - USN URL NW3276 (2-2) JMO Part 2	SS4000 (0-1) Seminar

Includes:

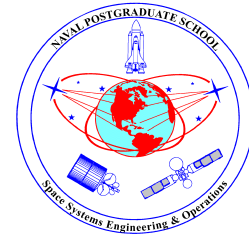
- No Refresher Quarter
- Integrated JPME
- N6 Info Systems Courses
- No Elective Slots

Legend

Prep Courses
366 Core
N6 IS core - USN Only
IPME - USN URL



Space Systems Operations (366) Core Curriculum ~~w/Refresher (USMC IO)~~



QUARTER	COURSE	COURSE	COURSE	COURSE	COURSE
0 (refresher- 12 wks recom.) 18	MA1113 (4-0) Single Var Calc	MA1114 (4-0) Matrix Algebra	PH1001 (4-2) Mechanics	PH1002 (4-2) Electricity & Mag	
1 (fall) 15.5	MO1903 (3-0) Applied Math for Space Sys	PH1322 (4-2) Electricity & Mag	IS3001 (4-2) Computer and Software Tech	SS3011 (3-0) Space Tech/Appl	SS4000 (0-1) Seminar
2 (winter) 17	OS2100 (3-1) Probability/Stats	SS3500 (4-2) Orbital Mech & Launch Sys	IW 3101 (4-1) Info Operations	EO2652 (4-1) Fields, Waves, & EM Engineering	SS4000 (0-1) Seminar
3 (spring) 17.5	EO3516 (4-2) Intro Comm Sys Eng	PH2514 (4-0) Space Environment	AE4830 (3-2) S/C Systems 1	EO3602 (4-2) Fields, Waves, & EM Engineering	SS4000 (0-1) Seminar
4 (summer) 18.5	EO4516 (4-2) Comm Sys Anal	MN3331 (5-1) ACQ Mgmt	CC3000 (4-0) Intro to C4I	EO4612 (4-2) Fields, Waves, & EM Engineering	SS4000 (0-1) Seminar
5 (fall) 16.5	PH3052 (4-0) Remote Sensing	SS3041 (4-2) Space Sys & Ops 1 SECRET	SS3613 (3-0) MILSATCOM Sys & Appl SECRET	AE 4831 (3-2) S/C Systems 2	SS4000 (0-1) Seminar
6 (winter) 16.5	SS3051 (4-0) Space Control (1st half QTR) TS/SCI	SS3001 (3-2) Mil Appl of Space (1st half QTR) TS/SCI	SS0810 (0-8) (2nd half QTR)	Experience Tour (2nd half QTR)	SS4000 (0-1) Seminar
7 (spring) 17	SS4051 (3-2) Mil Space Sys/ Arch TS/SCI	SS0810 (0-8) Thesis	SO3102 (4-0) Psychological Ops and Deception	IO4300 (3-2) Info Ops Planning & Execution	SS4000 (0-1) Seminar
8 (summer) 16	SS 0810 (0-8) Thesis	SS 0810 (0-8) Thesis	IS3502 (3-2) Comp Networks	CS3600 (4-2) Intro to Information Assurance	SS4000 (0-1) Seminar

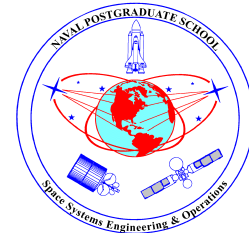
Includes:

- Full Refresher Quarter
- No JPME
- IO Option Courses
- No Elective Slots

Legend
Prep Courses
366 Core
USMC IO Core



Space Systems Operations (366)



Core Curriculum w/Refresher (USMC Weaps)

QUARTER	COURSE	COURSE	COURSE	COURSE	COURSE
0 (refresher-- 12 wks recom.) 18	MA1113 (4-0) Single Var Calc	MA1114 (4-0) Matrix Algebra	PH1001 (4-2) Mechanics	PH1002 (4-2) Electricity & Mag	
1 (fall) 15.5	MO1903 (3-0) Applied Math for Space Sys	IS3001 (4-2) Computer and Software Tech	PH2151 (4-1) Particle Mechanics	SS3011 (3-0) Space Tech/Appl	SS4000 (0-1) Seminar
2 (winter) 17	OS2100 (3-1) Probability/Stats	SS3500 (4-2) Orbital Mech & Launch Sys	IW3101 (4-1) Info Operations	PH3360 (4-1) Electromagnetic Waves	SS4000 (0-1) Seminar
3 (spring) 17.5	EO3516 (4-2) Intro Comm Sys Eng	PH2514 (4-0) Space Environment	AE4830 (3-2) S/C Systems 1	PH3991 (4-1) Theoretical Physics	SS4000 (0-1) Seminar
4 (summer) 18.5	EO4516 (4-2) Comm Sys Anal	MN3331 (5-1) ACQ Mgmt	PH4171 (4-0) Physics of Explosives	SE3172 (4-2) Physics of Weapons Systems	SS4000 (0-1) Seminar
5 (fall) 16.5	PH3052 (4-0) Remote Sensing	SS3041 (4-2) Space Sys & Ops 1 SECRET	SS3613 (3-0) MILSATCOM Sys & Appl SECRET	AE 4831 (3-2) S/C Systems 2	SS4000 (0-1) Seminar
6 (winter) 16.5	SS3051 (4-0) Space Control (1st half QTR) TS/SCI	SS3001 (3-2) Mil Appl of Space (1st half QTR) TS/SCI	SS0810 (0-8) (2nd half QTR)	Experience Tour (2nd half QTR)	SS4000 (0-1) Seminar
7 (spring) 17	SS4051 (3-2) Mil Space Sys/ Arch TS/SCI	SS0810 (0-8) Thesis	SE4022 (3-0) Combat Systems Capabilities	PH3292 (4-2) Applied Optics	SS4000 (0-1) Seminar
8 (summer) 16	SS 0810 (0-8) Thesis	SS 0810 (0-8) Thesis	CS3600 (4-2) Intro to Information Assurance	SE3800 (4-0) Survey of Weapons Effects	SS4000 (0-1) Seminar

Includes:

- Full Refresher Quarter
- No JPME
- Weapons Option Courses
- No Elective Slots

Legend

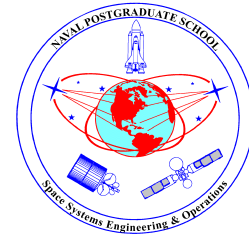
Prep Courses

366 Core

USMC Weapons
Core



Space Systems Operations (366)



Core Curriculum w/Refresher

(USMC Acq)

QUARTER	COURSE	COURSE	COURSE	COURSE	COURSE
0 (refresher - 12 wks recom) 18	MA1113 (4-0) Single Var Calc	MA1114 (4-0) Matrix Algebra	PH1001 (4-2) Mechanics	PH1002 (4-2) Electricity & Mag	
1 (fall) 15.5	MO1903 (3-0) Applied Math for Space Sys	IS3001 (4-2) Computer and Software Tech	EC4010 (4-2) Systems Engineering	SS3011 (3-0) Space Tech/Appl	SS4000 (0-1) Seminar
2 (winter) 17	OS2100 (3-1) Probability/Stats	SS3500 (4-2) Orbital Mech & Launch Sys	IW 3101 (4-1) Info Operations	MN3303 (4-0) Principles of Acq and Contract Management	SS4000 (0-1) Seminar
3 (spring) 17.5	EO3516 (4-2) Intro Comm Sys Eng	PH2514 (4-0) Space Environment	AE4830 (3-2) S/C Systems 1	MN3155 (2-0) Financial Mgmt for Acq Managers	SS4000 (0-1) Seminar
4 (summer) 18.5	EO4516 (4-2) Comm Sys Anal	MN3331 (5-1) ACQ Mgmt	IS3502 (3-2) Comp Networks	MN4304 (2-0) Defense Systems Contracting	SS4000 (0-1) Seminar
5 (fall) 16.5	PH3052 (4-0) Remote Sensing	SS3041 (4-2) Space Sys & Ops 1 SECRET	SS3613 (3-0) MILSATCOM Sys & Appl SECRET	AE 4831 (3-2) S/C Systems 2	SS4000 (0-1) Seminar
6 (winter) 16.5	SS3051 (4-0) Space Control (1st half QTR) TSSCI	SS3001 (3-2) Mil Appl of Space (1st half QTR) TSSCI	SS0810 (0-8) (2nd half QTR)	Experience Tour (2nd half QTR)	SS4000 (0-1) Seminar
7 (spring) 17	SS4051 (3-2) Mil Space Sys/ Arch TSSCI	SS0810 (0-8) Thesis	MN3315 (4-0) Acquisition Mgmt & Contract Admin	MN4371 (4-0) Acquisition & Contracting Policy	SS4000 (0-1) Seminar
8 (summer) 16	SS 0810 (0-8) Thesis	SS 0810 (0-8) Thesis	MN4106 (4-0) Acquisition Mgmt & Contract Admin	CS3600 (4-2) Intro to Information Assurance	SS4000 (0-1) Seminar

Includes:

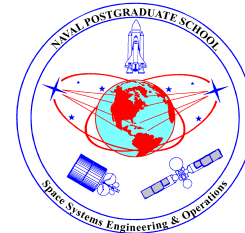
- Full Refresher Quarter
- No JPME
- Acquisition Option Courses
- No Elective Slots

Legend

Prep Courses
366 Core
USMC Acquisition Core



Space Systems Operations (366)



Core Curriculum w/Refresher

(USMC SE)

QUARTER	COURSE	COURSE	COURSE	COURSE	COURSE
0 (refresher-- 12 wks recom.)	MA1113 (4-0) Single Var Calc	MA1114 (4-0) Matrix Algebra	PH1001 (4-2) Mechanics	PH1002 (4-2) Electricity & Mag	SS3011 (3-0) Space Tech/Appl
21					
1 (fall)	MO1903 (3-0) Applied Math for Space Sys	OS3680 (3-0)* Naval Tactical Analysis	SI3112 (3-0)* Combat Technology I (Sensors)	SI3113 (3-0)* Combat Technology II (Weapons)	SS4000 (0-1) Seminar
12.50					
2 (winter)	OS2100 (3-1) Probability/Stats	SS3500 (3-2) Orbital Mech	SI4001 (4-1) Systems Engineering and Architecture	MN3331 (5-1) ACQ Mgmt	SS4000 (0-1) Seminar
18					
3 (spring)	EO3516 (4-2) Intro Comm Sys Eng	PH2514 (4-0) Space Environment	AA4830 (3-2) S/C Systems 1	OS3401 (3-1) Human Factors Engineering	SS4000 (0-1) Seminar
17					
4 (summer)	EO4516 (4-2) Comm Sys Anal	SI4112 (3-2) Combat Systems Engineering I	OS4680 (4-0) Naval Systems Analysis	OA4602 (4-0) Joint Campaign Analysis	SS4000 (0-1) Seminar
17.5					
5 (fall)	PH3052 (4-0) Remote Sensing	SS3041 (4-2) Space Systems and Operations 1 SECRET	SS3613 (3-0) MILSATCOM Sys & Appl SECRET	AA 4831 (3-2) S/C Systems 2	SS4000 (0-1) Seminar
21.5					
6 (winter)	SS3051 (4-0) Space Sys & Ops 2 (1st half QTR) TS/SCI	SS3001 (3-2) Mil Appl of Space (1st half QTR) TS/SCI	SS0810 (0-8) Experience Tour (2nd half QTR)	SS0810 (0-8) Experience Tour (2nd half QTR)	SS4000 (0-1) Seminar
16.5					
7 (spring)	SS0810 (0-8) Thesis	SS4051 (3-2) Mil Space Sys/ Arch TS/SCI	SI4113 (3-2) Combat Systems Engineering II	SI3002 (3-4) Engineering Project Management	SS4000 (0-1) Seminar
17.5					
8 (summer)	SS0810 (0-8) Thesis	SS0810 (0-8) Thesis	SI 3121 (3-0)* Combat Tech III (C4I)	OA4603 (3-2) Systems Test and Evaluation	SS4000 (0-1) Seminar
15.5					

Includes:

- Full Refresher Quarter
- No JPME
- SE Option Courses
- No Elective Slots

Legend

Prep Courses

366 Core

USMC SE Core

Notes:

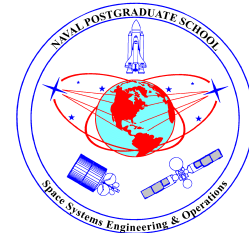
* block taught,
afternoons only



Space Systems Engineering (591)

Core Curriculum w/Refresher

(Navv TIR)



Engineering Science Refresher Quarter - 460

	Course	Course	Course	Course	Seminar	Course
0 Su 22	MA2043 (4-0) Matrix Algebra <i>Su</i>	MA1115 (4-0) MA1116 (4-0) Multi-variable Calculus <i>All</i>	PH1001 (4-2) Mechanics <i>Su</i>	PH1002 (4-2) E&M	SS4000 (0-1) Seminar	

Core Curriculum

1F 16.5	MA2121 (4-0) Differential Equations <i>All</i>	AE2820 (3-2) Spacecraft Structures <i>F</i>	EC2820 (3-2) Digital Logic Circuits <i>SpE</i>	J PME - NW3230 (4-0) Strategy & Policy <i>SpE</i>	SS4000 (0-1) Seminar	
2W 18	SS3100 (4-2) Orbital Mech & Launch Sys <i>W</i>	PH2514 (4-0) Space Environment <i>W</i>	MA3046 (4-1) Matrix Analysis <i>W/Su</i>	EC2300 (3-2) Controls <i>W/Su</i>	SS4000 (0-1) Seminar	
3 Sp 20	AE3815 (3-2) Spacecraft Dynamics <i>Sp</i>	EO2525 (4-1) Analysis of Comm Signals <i>Sp</i>	SS3525 (3-2) Remote Sensing <i>W/Sp</i>	Degree Specialization	SS4000 (0-1) Seminar	
4 Su 16.5	AE3851 (3-2) Spacecraft Propulsion <i>Su</i>	EO3525 (5-0) Communications Eng <i>Su</i>	AE3804 (3-0) Thermal Control of Spacecraft <i>Su</i>	Degree Specialization	SS4000 (0-1) Seminar	
5 F 17	PH3360 (4-1) EM Waves (or PH2351 & 3352) <i>F</i>	Degree Specialization	AE3818 (3-2) Spacecraft Attitude Dynamics & control <i>F</i>	Degree Specialization	SS4000 (0-1) Seminar	
6 W 15.5	AE3870 (2-2) (Accel) Spacecraft Design Tools <i>W</i>	SS3151 (4-0) Space Control (Accel) TS/SCI	SS3001 (3-2) (Accel) Military Applications of Space <i>W</i>	SS0810 (0-8) Thesis Research Experience Tour <i>W</i>	SS4000 (0-1) Seminar	
7 Sp 16	AE4870 (4-0) Spacecraft Design 1 <i>Sp</i>	Degree Specialization	Degree Specialization	Degree Specialization	SS4000 (0-1) Seminar	
8 Su 16.5	AE4871 (2-4) Spacecraft Design 2 <i>Su</i>	SS0810 (0-8) Thesis Research <i>All</i>	J PME - NW3285 (4-0) NSDM	J PME - NW3275 (4-0) J MO Part 1 <i>All</i>	SS4000 (0-1) Seminar	
9 F 17	MN3331 (5-1) Systems Acq & PM <i>Su</i>	SS0810 (0-8) Thesis Research <i>All</i>	SS0810 (0-8) Thesis Research <i>All</i>	J PME - NW3276 (2-2) J MO Part 2	SS4000 (0-1) Seminar	

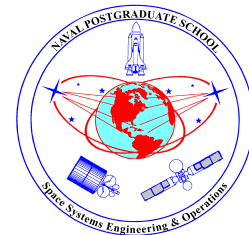
Includes:

- Full Refresher Quarter
- Integrated JPME
- Degree Specialization Options:

- MS-AE
- MS-CS
- MS-EE
- MS-PH



Space Systems Engineering (591)



Core Curriculum w/Refresher (Navy RI)

Engineering Science Refresher Quarter - 460

	Course	Course	Course	Course	Course
0 Su 20	MA2043 (2-0) Matrix Algebra <i>Su</i>	MA1115 (4-0) MA1116 (4-0) Multi-variable Calculus <i>all</i>	PH1001 (4-2) & Mechanics <i>Su</i>	PH1002 (4-2) E&M <i>Su</i>	SS4000 (0-1) Seminar

Core Curriculum

1F 16.5	MA2121 (4-0) Differential Equations <i>All</i>	AE2820 (3-2) Spacecraft Structures <i>F</i>	EC2820 (3-2) Digital Logic Circuits <i>Sp/F</i>	J PME - NW3230 (4-0) Strategy & Policy <i>All</i>	SS4000 (0-1) Seminar
2W 18	SS3000 (4-2) Orbital Mech & Launch Sys <i>W</i>	PH2514 (4-0) Space Environment <i>W</i>	MA3046 (4-1) Matrix Analysis <i>W/Su</i>	EC2300 (3-2) Controls <i>W/Su</i>	SS4000 (0-1) Seminar
3 Sp 17	AE3815 (3-2) Spacecraft Dynamics <i>Sp</i>	EO2525 (4-1) Analysis of Comm Signals <i>Sp</i>	SS3525 (3-2) Remote Sensing <i>W/Sp</i>	Degree Specialization	SS4000 (0-1) Seminar
4 Su 16.5	AE3851 (3-2) Spacecraft Propulsion <i>Su</i>	EO3525 (5-0) Communications Eng <i>Su</i>	AE3804 (3-0) Thermal Control of Spacecraft <i>Su</i>	Degree Specialization <i>all</i>	SS4000 (0-1) Seminar
5 F 17	PH3360 (4-1) EM Waves (or PH2351 & 3352) <i>F</i>	AE3818 (3-2) Spacecraft Attitude Dynamics & control <i>F</i>	Degree Specialization	Degree Specialization	SS4000 (0-1) Seminar
6 W 15.5	AE3870 (2-2) (Accel) Spacecraft Design Tools <i>W</i>	SS3001 (4-0) Space Control (Accel) TS/SCI	SS3001 (3-2) (Accel) Military Applications of Space TS/SCI	SS0810 (0-8) Thesis Research Experience Tour <i>W</i>	SS4000 (0-1) Seminar
7 Sp 15	AE4870 (4-0) Spacecraft Design 1 <i>Sp</i>	EC3230 (3-1) Space Power <i>W</i>	SS3035 (3-2) Microprocessors (or EC2840 & 3800) <i>Sp</i>	Degree Specialization	SS4000 (0-1) Seminar
8 Su 16.5	AE4871 (2-4) Spacecraft Design 2 <i>Su</i>	Degree Specialization <i>All</i>	Degree Specialization <i>All</i>	SS0810 (0-8) Thesis Research <i>All</i>	SS4000 (0-1) Seminar
9 F 18	MN3331 (5-1) Systems Acq & PM <i>Su</i>	SS0810 (0-8) Thesis Research <i>All</i>	SS0810 (0-8) Thesis Research <i>All</i>	Degree Specialization	SS4000 (0-1) Seminar

Includes:

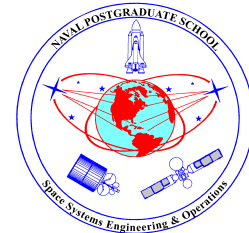
- Full Refresher Quarter
- No JPME
- Degree Specialization Options:

- MS-AE
- MS-CS
- MS-EE
- MS-PH



Space Systems Engineering (591)

MS-AE Curriculum w/Refresher



Engineering Science Refresher Quarter - 460

	Course	Course	Course	Course	Seminar	Course
0 Su 22	MA2043 (4-0) Matrix Algebra <i>Su</i>	MA1115 (4-0) MA1116 (4-0) Multi-variable Calculus <i>all</i>	PH1001 (4-2) Mechanics <i>Su</i>	PH1002 (4-2) E&M	SS4000 (0-1) Seminar	

Core Curriculum

1F 16.5	MA2121 (4-0) Differential Equations <i>All</i>	AE2820 (3-2) Spacecraft Structures <i>F</i>	EC2820 (3-2) Digital Logic Circuits <i>Sp/F</i>	J PME - NW3230 (4-0) Strategy & Policy <i>Sp/F</i>	SS4000 (0-1) Seminar	
2W 18	SS3500 (4-2) Orbital Mech & Launch Sys <i>W</i>	PH2514 (4-0) Space Environment <i>W</i>	MA3046 (4-1) Matrix Analysis <i>W/Su</i>	EC2300 (3-2) Controls <i>W/Su</i>	SS4000 (0-1) Seminar	
3 Sp 20	AE3815 (3-2) Spacecraft Dynamics <i>Sp</i>	EO2525 (4-1) Analysis of Comm Signals <i>Sp</i>	SS3525 (3-2) Remote Sensing <i>W/Sp</i>	AE3830 (3-2) Guidance & Control <i>Sp</i>	SS4000 (0-1) Seminar	AE3811 (2-2) Space Lab
4 Su 16.5	AE3851 (3-2) Spacecraft Propulsion <i>Su</i>	EO3525 (5-0) Communications Eng <i>Su</i>	AE3804 (3-0) Thermal Control of Spacecraft <i>Su</i>	ME3521 (3-2) Mech Vibrations <i>all</i>	SS4000 (0-1) Seminar	
5 F 17	PH3360 (4-1) EM Waves (or PH2351 & 3352) <i>F</i>	AE4850 (3-2) Astrodynamic Optimization <i>F</i>	AE3818 (3-2) Spacecraft Attitude Dynamics & control <i>F</i>	AE3820 (3-2) Space Systems Dynamics <i>F</i>	SS4000 (0-1) Seminar	
6 W 15.5	AE3870 (2-2) (Accel) Spacecraft Design Tools <i>W</i>	SS3051 (4-0) Space Control (Accel) TS/SCI	SS3001 (3-2) (Accel) Military Applications of Space <i>W</i>	SS0810 (0-8) Thesis Research Experience Tour <i>W</i>	SS4000 (0-1) Seminar	
7 Sp 16	AE4870 (4-0) Spacecraft Design 1 <i>Sp</i>	EC3230 (3-1) Space Power <i>W</i>	SS3035 (3-2) Microprocessors (or EC2840 & 3800) <i>Sp</i>	AE4816 (4-0) Dyn & Control of Smart Structures <i>W</i>	SS4000 (0-1) Seminar	
8 Su 16.5	AE4871 (2-4) Spacecraft Design 2 <i>Su</i>	SS0810 (0-8) Thesis Research <i>All</i>	J PME - NW3285 (4-0) NSDM <i>Sp</i>	J PME - NW3275 (4-0) J MO Part 1 <i>All</i>	SS4000 (0-1) Seminar	
9 F 17	MN3331 (5-1) Systems Acq & PM <i>Su</i>	SS0810 (0-8) Thesis Research <i>All</i>	SS0810 (0-8) Thesis Research <i>All</i>	J PME - NW3276 (2-2) J MO Part 2 <i>All</i>	SS4000 (0-1) Seminar	

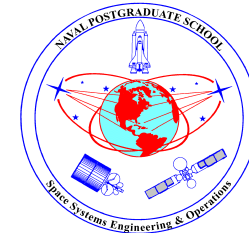
Includes:

- Full Refresher Quarter
- Integrated JPME
- Astronautical Engineering Degree Option (MS-AE)



Space Systems Engineering (591)

MS-AE Curriculum w/Refresher



Engineering Science Refresher Quarter - 460

	Course	Course	Course	Course	Course	Course
0 Su	MA2043 (4-0) Matrix Algebra <i>Su</i>	MA1115 (4-0) MA1116 (4-0) Multi-variable Calculus <i>all</i>	PH1001 (4-2) Mechanics <i>Su</i>	PH1002 (4-2) E&M	SS4000 (0-1) Seminar	

Core Curriculum

1F	AE2440 Digital Computation <i>F</i>	MA2121 (4-0) Differential Equations <i>All</i>	AE2820 (3-2) Spacecraft Structures <i>F</i>	EC2820 (3-2) Digital Logic Circuits <i>SpF</i>	SS4000 (0-1) Seminar	
2W	SS3500 (4-2) Orbital Mech & Launch Sys <i>W</i>	PH2514 (4-0) Space Environment <i>W</i>	MA3046 (4-1) Matrix Analysis <i>WSu</i>	EC2300 (3-2) Controls <i>WSu</i>	SS4000 (0-1) Seminar	
3 Sp 19.5	AE3815 (3-2) Spacecraft Dynamics <i>Sp</i>	E02525 (4-1) Analysis of Comm Signals <i>Sp</i>	SS3525 (3-2) Remote Sensing <i>WSu</i>	AE3830 (3-2) Guidance & Control <i>Sp</i>	SS4000 (0-1) Seminar	AE3811 (2-2) Space Lab
4 Su	AE3851 (3-2) Spacecraft Propulsion <i>Su</i>	E03525 (5-0) Communications Eng <i>Su</i>	AE3804 (3-0) Thermal Control of Spacecraft <i>Su</i>	ME3521 (3-2) Mech Vibrations <i>all</i>	SS4000 (0-1) Seminar	
5 F	PH3360 (4-1) EM Waves (or PH2351 & 3352) <i>F</i>	AE4850 (3-2) Astrodynamic Optimization <i>F</i>	AE3818 (3-2) Spacecraft Attitude Dynamics & control <i>F</i>	AE3820 (3-2) Space Systems Dynamics <i>F</i>	SS4000 (0-1) Seminar	
6 W	AE3870 (2-2) (Accel) Spacecraft Design Tools <i>W</i>	SS3051 (4-0) Space Control (Accel) TSSCI <i>W</i>	SS3001 (3-2) (Accel) Military Applications of Space <i>W</i>	SS0810 (0-8) Thesis Research Experience Tour <i>W</i>	SS4000 (0-1) Seminar	
7 Sp	AE4870 (4-0) Spacecraft Design 1 <i>Sp</i>	EC3230 (3-1) Space Power <i>W</i>	SS3035 (3-2) Microprocessors (or EC2840 & 3800) <i>Sp</i>	AE4816 (4-0) Dyn & Control of Smart Structures	SS4000 (0-1) Seminar	
8 Su	AE4871 (2-4) Spacecraft Design 2 <i>Su</i>	ME or AE Elective <i>All</i>	J PME - NW3230 (4-0) Strategy & Policy <i>all</i>	SS0810 (0-8) Thesis Research <i>All</i>	SS4000 (0-1) Seminar	
9 F	MN3331 (5-1) Systems Acq & PM <i>Su</i>	SS0810 (0-8) Thesis Research <i>All</i>	SS0810 (0-8) Thesis Research <i>All</i>	Elective <i>All</i>	SS4000 (0-1) Seminar	

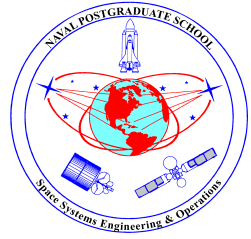
Includes:

- Full Refresher Quarter
- No JPME
- Astronautical Engineering Degree Option (MS-AE)



Space Systems Engineering (591)

MS-EE Curriculum w/Refresher (Navy URL)



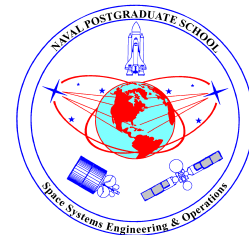
Includes:

- **Full Refresher Quarter**
- **Integrated JPME**
- **Electrical Engineering Degree Option (MS-EE)**



Space Systems Engineering (591)

MS-PH Curriculum w/Refresher



Engineering Science Refresher Quarter - 460

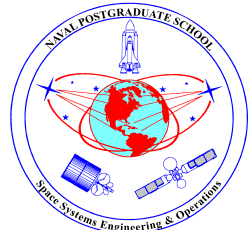
	Course	Course	Course	Course	Course
0 Su 20	MA2043 (2-0) Matrix Algebra <i>Su</i>	MA1115 (4-0) MA1116 (4-0) Multi-variable Calculus <i>all</i>	PH1001 (4-2) & Mechanics <i>Su</i>	PH1002 (4-2) E&M <i>Su</i>	SS4000 (0-1) Seminar

Core Curriculum

1F 16.5	MA2121 (4-0) Differential Equations <i>All</i>	AE2820 (3-2) Spacecraft Structures <i>F</i>	EC2820 (3-2) Digital Logic Circuits <i>Sp/F</i>	J PME - NW3230 (4-0) Strategy & Policy <i>All</i>	SS4000 (0-1) Seminar
2W 18	SS3500 (4-2) Orbital Mech & Launch Sys <i>W</i>	PH2514 (4-0) Space Environment <i>W</i>	MA3046 (4-1) Matrix Analysis <i>W/Su</i>	EC2300 (3-2) Controls <i>W/Su</i>	SS4000 (0-1) Seminar
3 Sp 17	AE3815 (3-2) Spacecraft Dynamics <i>Sp</i>	EO2525 (4-1) Analysis of Comm Signals <i>Sp</i>	PH3052 (3-2) Remote Sensing <i>All</i>	PH3655 (4-0) Solid-State Physics or PH3991 (4-0) Theoretical Physics <i>W/Su</i>	SS4000 (0-1) Seminar
4 Su 16.5	AE3851 (3-2) Spacecraft Propulsion <i>Su</i>	EO3525 (5-0) Communications Eng <i>Su</i>	AE3804 (3-0) Thermal Control of Spacecraft <i>Su</i>	PH3151 (4-0) Mechanics III <i>Su</i>	SS4000 (0-1) Seminar
5 F 17	PH3360 (4-1) EM Waves (or PH2351 & 3352) <i>F</i>	AE3818 (3-2) Spacecraft Attitude Dynamics & control <i>F</i>	PH3292 (4-2) Applied Optics or PH3655 Solid State <i>F</i>	SS0810 (0-8) Thesis Research	SS4000 (0-1) Seminar
6 W 15.5	AE3870 (2-2) (Accel) Spacecraft Design Tools <i>W</i>	SS3151 (4-0) Space Control (Accel) TS/SCI <i>W</i>	SS3001 (3-2) (Accel) Military Applications of Space TS/SCI <i>W</i>	SS0810 (0-8) Thesis Research Experience Tour <i>W</i>	SS4000 (0-1) Seminar
7 Sp 15	AE4870 (4-0) Spacecraft Design 1 <i>Sp</i>	EC3230 (3-1) Space Power <i>W</i>	SS3035 (3-2) Microprocessors (or EC2840 & 3800) <i>Sp</i>	SS0810 (0-8) Thesis Research	SS4000 (0-1) Seminar
8 Su 16.5	AE4871 (2-4) Spacecraft Design 2 <i>Su</i>	PH4656 (4-1) Quantum Mechanics <i>Su</i>	PH4274 (4-1) Radars <i>Su</i>	PH4272 (4-1) EO Sensors II <i>Su</i>	SS4000 (0-1) Seminar
9 F 18	MN3331 (5-1) Systems Acq & PM <i>Su</i>	SS0810 (0-8) Thesis Research <i>All</i>	PH4273 (4-2) Advanced Imaging <i>Su</i>	PH4271 (4-1) EO Sensors I <i>Su</i>	SS4000 (0-1) Seminar

Includes:

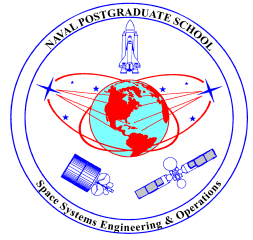
- Full Refresher Quarter
- No JPME
- Physics Degree Option (MS-PH)



Program Office/Academic Associate Support



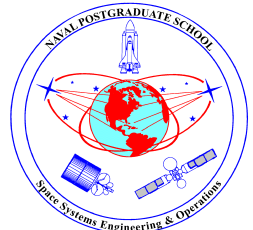
Program Officer Responsibilities



- What does a Program Officer do?
 - Sponsor liaison
 - Curriculum development/management
 - Develop/maintain ESRs
 - Establish standard curricula meeting academic degree requirements and service needs
 - Career counseling/guidance of officers (Senior AEDO)
 - Oversee proper performance of academic study in conjunction with Academic Associate
 - Satisfaction of military requirements
 - Monitor individual programs, approve add/drop requests, etc
 - Other duties as required
 - NPS Space Professional Oversight Board (SPOB) Rep
 - NPS Joint Space Academic Group (JSAG) Rep
 - Teaching (if there's time....)



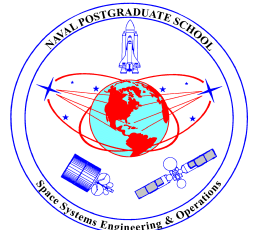
Program Officer / Academic Associate Team



- Academic Associate is primary advisor for satisfaction of academic degree requirements
 - Also a resource for research project topic and guidance
- Program Officer and Academic Associate work closely together on all academic and curriculum issues
 - Keep us both informed regarding any academic issue
- For course changes and matrix changes signatures of both individuals are required (see Academic Associate first)



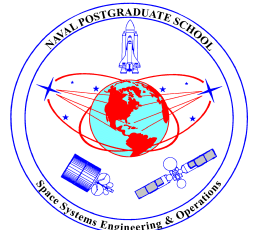
My Philosophy To Support You



- My goal is to see you all walk across the stage two years from now (more or less)
- Your academic success is paramount; all requests will be considered in light of impact on studies
- Please let me know of any “extraordinary” pressures or events that may impact your timing or success
 - Academic problems
 - Medical issues—personal and family



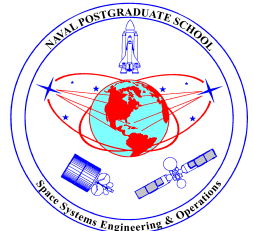
Philosophy Of Support (Cont.)



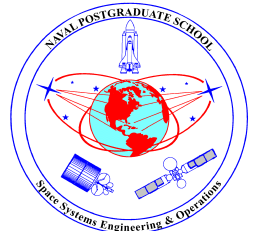
- My philosophy: Balance is key
 - NPS provides a unique opportunity to take a “time out” from normal career demands to focus on technical graduate education
 - The next two years will also provide a chance to spend more time focusing on family matters
 - Take advantage of both of these opportunities!
- I communicate regularly with detailers and can help with the orders process
- My door is open for you to come in with questions!



Ed Tech Administration



- Your BEST FRIEND
 - Can assist with scheduling of classes, changes to course matrices, etc
 - Can assist with travel and other admin support items
 - Manages locker assignments
- Keep Ed Tech up to date regarding any changes to your status
 - Ensure all personal and emergency information is up to date in Python

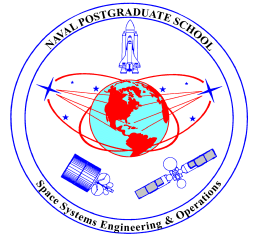


Section Leaders

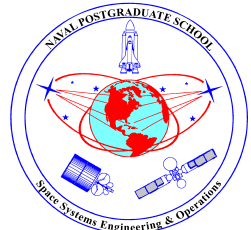
- Section Leader normally the senior officer in the section.
 - Focal point for miscellaneous admin items
 - PRT, Combined Federal Campaign (CFC), Navy/Marine Corps Relief Society, etc.
 - Coordination of Experience Tour and other curriculum events
 - Primary communication link to Program Officer/Student Services
 - Maintain recall roster
- Your Section Leader = Department Head
 - Keep him/her advised of EVERYTHING. They might not necessarily need to know but it's good for someone in the class to be aware when you are excused, ill, etc.
 - Expect your section leaders to delegate.....
- Route all requests through the SL (Leave, travel, special request, etc.)



Grades



- 3.00 GQPR (Graduate Quality Point Rating) required to graduate
 - Includes 3000/4000 level courses except NW
 - Thesis is “Pass/Fail”
 - Credit hours = class hours + (lab hours / 2)
- Opportunity to repeat classes is limited
- Talk to your professors if you are struggling
 - You may be able to do extra homework or repeat a test for additional credit
 - Show you care!
- Discuss problems with Academic Associate/Program Officer
 - Don’t let the first notice be an academic probation letter
 - We can’t help if we don’t know you are having problems

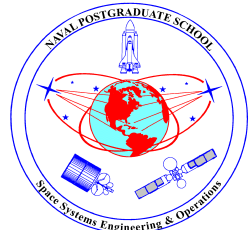


Thesis Process

- Pick a topic area of interest
 - Research topic ideas can be obtained from many resources including Space Seminars, discussions with SSAG Professors, etc.
- Find a thesis advisor and associate advisor (second reader)
 - The Principal Advisor must be a full-time member of the NPS faculty.
 - Associate Advisors are normally chosen from the NPS faculty but can be from other agencies/institutions.
 - One of the advisors must have earned a Doctorate
 - For Space Systems Ops and Engineering - either the Principal or Associate Advisor must be from within the Space Systems Academic Group (SSAG)
- Develop a proposal in proper format, obtain signatures and put on file with Ed Tech
 - Space Systems Operations students follow Space Ops Thesis guide
 - Space Systems Engineers follow guidance from department granting degree
 - Thesis proposals due to the Program Office prior to going on experience tour
- Commence research
- Attend a Thesis Processing Workshop
- Get thesis format template online - see Research Office website
- Maintain continuous communication with advisor to prevent misunderstandings and ensure timely information exchange.
- Submit final product to Thesis Processor. If acceptable, you get a certificate of completion - your **green** card!



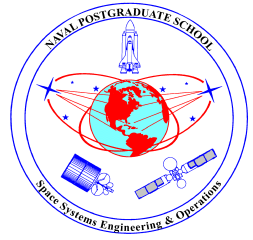
Routine Communications/ Academic Support



- NPS Intranet Student Web Site
 - Daily announcements/notification of all significant NPS student events (Guest lectures, etc)
 - Electronic check-in (daily)
 - Fill out electronic request to miss muster for all Leave, Liberty and TDY periods
- E-mail
 - Check twice daily, but no later than 1130
- Python
 - <http://intranet.nps.navy.mil/ITACS/Python.htm>
 - Fill in all the fields in PYTHON that pertain - today!
 - Keep your address/telephone # current
- Blackboard
 - <http://nps.blackboard.com>
- SSAG Site
 - <http://www.sp.nps.navy.mil/>



Student Information



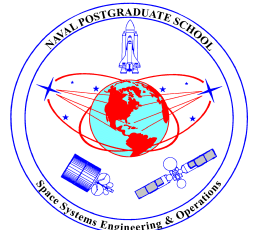
- Review information at the Student website:

<http://intranet.nps.navy.mil/Students.htm>

- Links provided to New and Current Student Resources
 - Daily Check-in /Announcements Link
 - Student Information Handbook
 - NPS Course Catalog
 - Academic Calendar
 - Thesis Processing Website Link
 - Leave/Liberty/Travel Policy and Procedures
 - Family Resources Center
 - MWR and Presidio Outdoor Recreation
 - Housing Information
 - Relocation Information
 - Medical/Dental Info
- Other resources
 - Academic Council Policy Manual
 - Dual degree requests,etc



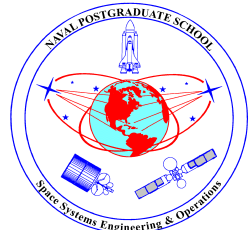
Miscellaneous Info



- Leave procedures
 - For leave during normal break periods
 - Send request directly to “Student Leave” group e-mail address w/cc to Program Officer
 - For leave/travel during academic quarter
 - Send request to Program Officer for approval and further routing
 - Verify that either
 - No classes will be missed, or
 - Professors for any classes that will be missed have approved your absence
- Fill out electronic request to miss muster for all Leave, Liberty and TDY periods
- FITREP’s are generated by student services
 - See student handbook/web site for procedures



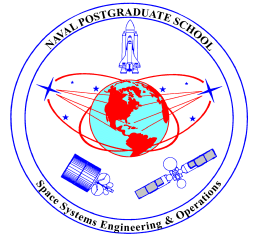
Miscellaneous Info



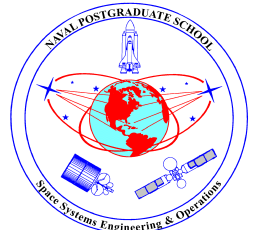
- Class Attendance
 - Attendance at all class sessions is mandatory
 - Professors and Section Leaders must be notified when absence is unavoidable
 - Professors and Section Leaders will notify Program Officer in cases of repeated absence
 - Don't ever forget you are being paid a lot of money by the taxpayers of this country to go to school!
- Other Mandatory Events
 - Superintendents Guest Lectures
 - Usually scheduled on Tuesdays at 1500
 - Attendance is mandatory, uniform required (see student announcement page)
 - Urinalysis
 - Don't miss your opportunity to contribute!
 - SS4000 Seminar
 - Usually announced via e-mail/meeting invite
 - Check the website "<http://www.sp.nps.navy.mil/>"
 - User name: ss4000 password: nps4000!



Miscellaneous Info

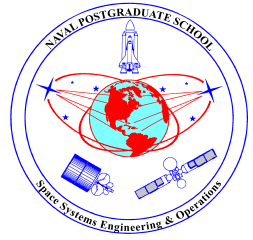


- Academic Honor Code
 - Violations could lead to adverse FITREP or disenrollment
- Classroom conduct
 - Be professional and courteous
 - On time and prepared
- Alcohol
- Fraternization



Miscellaneous Info

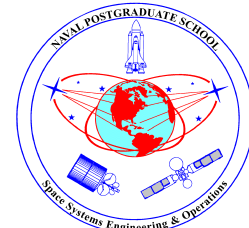
- Space Systems Student Study Area
 - Located in basement of King Hall Auditorium
 - Currently being upgraded/outfitted with new computers, projector etc to support group project work, etc
 - POC: Capt Sean Riley, USMC
- Security Clearance
 - If you don't have a TS/SCI clearance and paperwork for your background investigation has not been initiated, see the security manager ASAP. It can take up to 1 year to get a new clearance!
- Student Feedback
 - SOFs
 - Student exit surveys – needed for Accreditation
 - Real time



Questions?

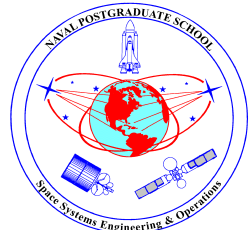


Backup





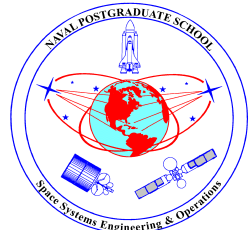
Important Milestones in NPS Space Program



- 1961 -- First two Astronauts (of a total of 33) graduate from NPS**
- 1982 -- Space Systems Academic Committee formed**
- 1982 -- First NRO classified space research grant**
- 1982 -- Space Systems SCI research lab established**
- 1982 -- First NRO classified space research grant**
- 1984 -- Space Systems Academic Group (SSAG) formed**
- 1984 -- First MS in Space Systems Operations awarded**
- 1985 -- First SCI Space Systems Thesis**
- 1987 -- Department of Aeronautics expanded to include Astronautics**
- 1989 -- First MS in Astronautical Engineering awarded**
- 1990 -- FLTSATCOM qualification spacecraft obtained for laboratory**
- 1991 -- Navy TENCAP Chair established**
- 1991 -- Ferro-electric materials payload on DATASAT-X satellite (launched from an Ariane rocket)**
- 1992 -- Naval Space Command Chair established**
- 1992 -- Thermo-acoustic refrigerator flown on Space shuttle (STS-42)**
- 1993 -- First PhD in Astronautical Engineering awarded**
- 1994 -- Naval Space Technology Program Chair established**



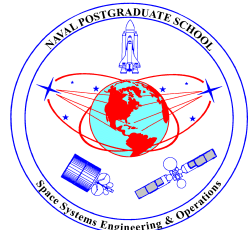
Important Milestones in NPS Space Program



- 1994 -- Ferro-electric memory experiment payload on APEX (Advanced Photovoltaic and Electronics Experiment) satellite**
- 1995 -- ABET accreditation of MS degree in Astronautical Engineering**
- 1995 -- NASA Chair established**
- 1996 -- Center for Reconnaissance Research established**
- 1996 -- Research Center for Military Applications of Space established**
- 1996 -- Spacecraft Research and Design Center established**
- 1998 -- First NPS satellite (PANSAT) launched from shuttle (STS-95)**
- 1998 -- First international officer to become astronaut graduates from NPS**
- 1999 -- PANSAT passes through solar eclipse**
- 1999 -- Center for Radiation Hardened Electronics established**
- 1999 -- NRO Chair established**
- 2001 -- MASINT Chair and Research Center established**
- 2001 -- Latest ABET review**
- 2001 -- Lockheed-Martin Space Chair established**
- 2002 -- NPS/AFRL Optical Relay Mirror Spacecraft Laboratory dedicated**
- 2003 -- Major Renovation of Small Satellite Laboratory**
- 2003 -- First Astronaut In Residence joined NPS faculty**



National Security Focus of Space Systems Programs



Significant military/Intel Community research emphasis...

- **Unclassified Thesis Titles:**

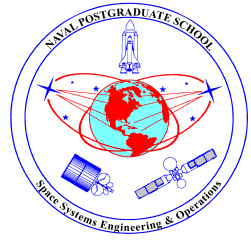
- "A ForceNet Framework For Analysis Of Existing Naval C4I Architectures "
- "Hyperspectral Imaging Using Ultraviolet Light"
- "Detection And Characterization Of Temporal Phenomena With High Resolution Satellite Imagery"
- "Laboratory Experimentation Of Autonomous Spacecraft Docking Using Cooperative Vision Navigation"
- "Radiation Testing Of The Configurable Fault Tolerant Processor (CFTP) For Space-based Applications"
- "Optical Beam Control Using Adaptive Optics"
- "Vegetation Identification With LIDAR"

- **Classified Thesis (SI/TK) Areas**

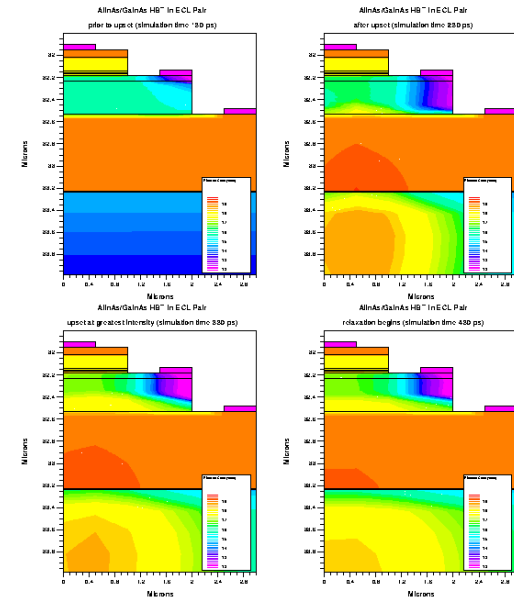
- Theater Ballistic Missile Defense (TBMD) Engagement with Aegis Platforms
- Mobile User Objective System (MUOS) Architecture
- Transformational Communications System (TCS) Architecture
- Prediction of Helicopter Brownout Conditions using Remote Sensing Satellites
- Reducing the Engagement Cycle (Kill chain) Time
- Space Situational Awareness



NPS Center for Radiation Hardened Electronics

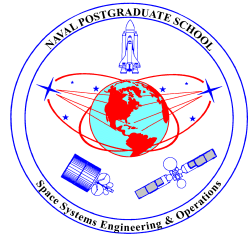


- Provide experimental, simulation and educational support to space and strategic customers such as,
 - **NRO, NSA, AFRL, NRL, SPAWAR, DMEA, LBL, NASA, AFOSR, SSP, NSWC Crane**
 - **Motorola, SAIC, Honeywell, Vitesse, Hughes/HRL, Boeing, Draper, DRC, Suntronics, MIT-LL, IQE, Ball-Aero, Silvaco, Litton**
 - **UC Berkeley, U of Michigan, Vanderbilt, UCSB**
- Operate 100MeV electron accelerator, and Flash X-ray facilities
 - NPS recently supported SAIC/NG engineers in validating SBIRs, GPS and EHF components at these facilities.
- Since 1995 over 50 graduate degrees have been granted in radiation effects.





Space Systems Certificate

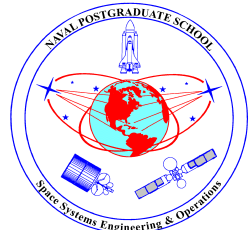


- Certificate Courses Include:
 - SS3011 Space Technology and Applications
 - First course developed (offered 15 consecutive quarters)
 - Approx 390 students complete (40% were deployed)
 - SS3613 Military Satellite Communications (MILSATCOM)
 - PH3052 Physics of Space and Airborne Sensor Systems
 - OC2902 Fundamentals of Geospatial Information and Services (GIS)





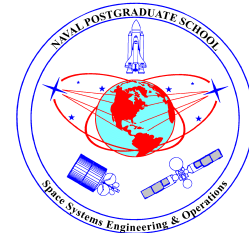
Space Systems Certificate



- Web-based basic graduate space education for all NSS professionals (Officer, Enlisted, and Civilians) – B.A. or B.S. required to enroll
 - Course credit can be directly transferred to NPS degree programs
- Students from:
 - USN (Carrier, cruiser based, during OEF/OIF)
 - USMC (Bahrain during OIF)
 - USAF (Space Superiority Systems Program Office)
 - DISA, STRATCOM, PACOM, USA Reserve...
- Completion of Space Systems Certificate - qualifies for entry into USN Space Cadre
 - First certificate students (25) completed Dec 2004
 - Two cohorts currently in flow (50 students)
 - Two additional cohorts starting in 2006 (50 students)
 - Several cohorts of the Space Systems certificate are taught within the MS Systems Engineering program as a focus/emphasis area
- Current effort is focused on aligning content with NSS education leaders – creating additional courses/degree program



Navy Space Cadre Billet Locations



Command	Location	# of Billets
STRATCOM	CO Springs	2
US PAC CB	CO Springs	13
NORTHCOM	CO Springs	2
SSFA DET	Denver	3
MISC	CO Springs	7

Command	Location	# of Billets
USSTRATCOM	Omaha	20

Command	Location	# of Billets
CNE DET	Naples	3
CNNSOC DET ECHO	Stuttgart	1
JSSTL-EUCOM LNO	Stuttgart	1
CNNSOC DET PACIF	Osan	1
MISC Japan	Yokota	1

Command	Location	# of Billets
NSSO	DC	5
DISA/DIA	DC	4
MISC	DC	4
Naval ACAD	Annapolis	1

Command	Location	# of Billets
NPS	Monterey	2

Command	Location	# of Billets
NAVSOC	Pt Mugu	6

CO SPGS/
DENVER
27

OMAHA
20

MONTEREY
2

PT MUGU
6

SD/LA
17

HAWAII
2

JSC
Houston
9

Potential
Fleet Billets
~145

OCONUS
7

NEWPORT
1

DC/MD
14

DAHLGREN
NORFOLK
VA BEACH
38

N. VA
93

Command	Location	# of Billets
NNSOC	Dahlgren	30
NNWC	Va Beach	4
MISC	Norfolk	3

Command	Location	# of Billets
PEO C4I Space	San Diego	6
PEO Space PMW 146	San Diego	5
SSC NWCF	San Diego	3
MILSATCOM	Los Angeles	3

Command	Location	# of Billets
USNELDODPOACOM	Honolulu	1
COMPACFLT	Honolulu	1

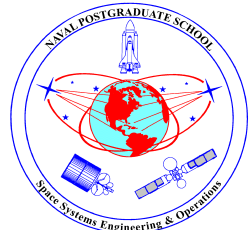
Command	Location	# of Billets
SSFA	Chantilly	74
OPNAV	Arlington	9
TENCAP	Arlington	4
OSD	Arlington	3
JNTSTF	Arlington	3

Total Billets = 240
As of Aug 05

Source: Aug 05 TFMMS



NPS Space Systems Programs



- Strong Emphasis on **National Security Space** Operations
- Significant Classified Content (**Current And Relevant**)
- Student Population – **Warfighters** from All Services
- Experienced Faculty/Chairs
- Unique Facilities
- Instructional Delivery - **Worldwide**



“Effective use of space assets - a fundamental requirement for the U.S. military to conduct offensive and defensive operations. “
[JCS Pub 3-14, Joint Doctrine for Space Operations]